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Contribution from the Bureau of Entomology, L. O. Howard, Chief.

## THE LEAF BLISTER MITE OF PEAR AND APPLE.<sup>1</sup>

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### INTRODUCTION.

Leaf blister mites are among the smallest of animal forms which attack horticultural crops. These minute creatures, only one one-



FIG. 1.—Apple leaves injured by the leaf blister mite. (Original.)

hundred-and-fiftieth of an inch in length, are invisible to the unaided eye, and as seen under a good hand lens appear as the merest

<sup>1</sup> *Eriophyes pyri* Pagenstecher; order Acarina, family Eriophyidae.

speck. Although the mites themselves are probably unfamiliar to most orchardists, their work is well known to pear growers and apple growers in the reddish or greenish pimples or blisterlike spots to be noted in early spring on the young foliage of these plants. Later these blisters become brown and dead, spotting and blotching the leaves, the injury resembling that due to leaf-spot fungi or from sprays, with which injury, in fact, the work of this mite is frequently confused. When the creatures are abundant the foliage may be almost covered with the blisters or brown spots, and the usefulness of the leaves to the tree is thus greatly impaired. Foliage severely injured will fall prematurely, retarding the development of the fruit, and in extreme cases much of the crop will fall to the ground. (See fig. 1.)

The leaf blister mite is not an insect but belongs to that class of animals containing the spiders, scorpions, daddy-long-legs, etc., and to the order represented by such well-known forms as the scab mite of sheep, the cattle tick, and the red spider. Its family contains numerous species, all of which are plant feeders, attacking principally the buds and leaves. Several members of the family are of much economic importance. One<sup>1</sup> infests *vinifera* varieties of grapes in portions of Europe and in California, producing the so-called "erinoise" of the vine. Another<sup>2</sup> is the cause of the nail-like galls sometimes found on the leaves of plum. A third<sup>3</sup> infests the fruit and foliage of the orange, producing a russeted condition. A fourth<sup>4</sup> feeds upon the upper surface of the leaves of the peach, so injuring them as to give the foliage a silvery sheen. Still another<sup>5</sup> occurs on the foliage of the apple, and in Montana very important injuries have been attributed to it.

#### ORIGIN AND DISTRIBUTION.

The leaf blister mite is not native to the United States and was probably introduced at an early period, presumably from Europe on nursery stock, buds, or scions. It was first recorded in the United States in 1872, and since that date has made its appearance in the principal pear-growing regions of the United States and Canada. It is known to occur in England, Russia, and certain other European countries, is recorded from Tasmania, and is probably present in other fruit-growing regions of the world, being at the present time a truly cosmopolitan pest.

<sup>1</sup> *Eriophyes vitis* Landois.

<sup>2</sup> *Eriophyes padi* Nalepa (= *E. prun-crumena* Walsh).

<sup>3</sup> (*Typhlodromus*) *Phyllocoptes oleivorus* Ashmead.

<sup>4</sup> *Phyllocoptes cornutus* Banks.

<sup>5</sup> *Phyllocoptes schlechtendali* Nalepa.

## CHARACTER OF INJURY AND DESTRUCTIVENESS.

The mites pass the winter on the trees, under the bud scales, and attack the leaves as soon as these begin to push out in the spring. They bore small holes from the underside to the interior of the leaf, where they deposit their eggs, and with their progeny feed upon the tender cells of the leaf substance. Their activities within the leaf tissues very quickly result in the development of galls or swellings. These are at first small, pimple-like eruptions, especially evident on the upper surface of young leaves, whitish in color on the apple, but usually with a reddish tinge on the pear. The spots soon increase in size, the largest becoming as much as one-eighth of an inch in diameter. On pear leaves the spots, as a rule, become red, often brilliantly colored as they grow, whereas on apple this reddish coloring is absent or faint. On the underside of the leaf the galls are whitish and blisterlike, not differing much from the general color of the leaf surface. Later they turn brownish or black, due to the death of the injured leaf cells, lose much of their thickness, and some may become somewhat shrunken. Figure 2 illustrates a gall on pear leaf as seen in cross section, the normal structure being shown at *n*; *o* is the opening to the interior of the gall and *c* designates eggs of the mite. A cross section of one of the dried-up galls is shown in figure 3.



FIG. 2.—Pear leaf gall, in cross section, of leaf blaster mite: *o*, Opening of gall; *c*, eggs of mite; *n*, normal structure of leaf. (After Borauer.)



FIG. 3.—Section of pear leaf, showing structure of gall of blaster mite in autumn; *o*, gall; *o*, opening of gall. (After Comstock.)

On pear, the galls occur more along each side of the midrib of the leaf and on apple at the base of and along the margins of the leaf. When numerous, however, the spots will merge together, forming large patches or bands of variable size, often involving most of the leaf. When thus abundant the leaves may become more or less ruptured and wrinkled, and in the case of the apple the margins may curl up, showing the underside. Leaves badly infested are likely to fall prematurely, resulting also in the dropping of the fruit from clusters with worst injured foliage. The fruit and fruit-stems of

both apple and pear are also attacked, the light-colored pinwheels occurring mostly around the calyx end of the fruit and resulting in no material injury. The injury to the fruit-stems is noticeable as irregular thickenings, and when severe may cause some of the fruit to fall, although loss from this source, even in worst infested orchards, will not be great.

### FOOD PLANTS.

Pear and apple are the more common food plants of the blister mite, though other plants are attacked. The mite has been recorded from foliage on the white beam tree,<sup>1</sup> the European mountain ash,<sup>2</sup> the wild service tree,<sup>3</sup> the service berry,<sup>4</sup> and the common cotoneaster.<sup>5</sup>

According to one entomologist the mites have been found on over 250 varieties of apples, injury being severe on some well-known commercial sorts, as Ben Davis, King, Baldwin, Rhode Island Greening, and at the agricultural experiment station at Geneva, N. Y., the Williams Favorite was noted to be especially subject to attack, the trees having been prematurely defoliated for two successive seasons.

### DESCRIPTION AND HABITS.

The general appearance of the blister mite is shown in figure 4 in dorsal and ventral views. The mite is microscopic in size, measuring on the average about one one-hundred-and-fiftieth inch in length, whitish in color, a few individuals pinkish. The abdomen slopes gradually toward the posterior end and is numerously ringed. There are only two pairs of legs, and these and the body bear setæ which, from their character and location, are of importance in the determination of species in this group, as are also the number and character of rings on the abdomen. The young, except in size, bear a general likeness to the adults, and the eggs, though proportionately large as compared in size with the parent, are only 46 microns through the greater diameter. These are whitish, translucent, with rounded ends, and are deposited in the interior of the galls (see fig. 2). The resulting larvæ feed upon the cellular leaf substance, working out in various directions, though they are not especially active.

The mites are to be found on the foliage from their appearance in spring until fall, and several generations are evidently produced in a season. Hibernation occurs under the bud scales, the mites often congregating in colonies of 50 or more. They become active in the spring, often before the buds burst, congregating around the base of

<sup>1</sup> *Sorbus aria* Crantz. <sup>2</sup> *Sorbus aucuparia* L. <sup>3</sup> *Sorbus terminalis* Crantz. <sup>4</sup> *Amelanchier vulgaris* Moench. <sup>5</sup> *Cotoneaster vulgaris* Lindl.

bud scales, where they feed, many molting at this time. With the bursting of the buds and the pushing out of the tender leaves, these are attacked and the characteristic blisterlike spots soon develop.

Notwithstanding the minute size of these creatures, they fall prey in considerable number to the attack of a mite (*Scius pomi* Parrott) which is thought to assist materially in reducing their numbers.

#### METHODS OF CONTROL.

The leaf blister mite will yield to thorough treatment with kerosene emulsion, miscible oils, or lime-sulphur washes. The use of

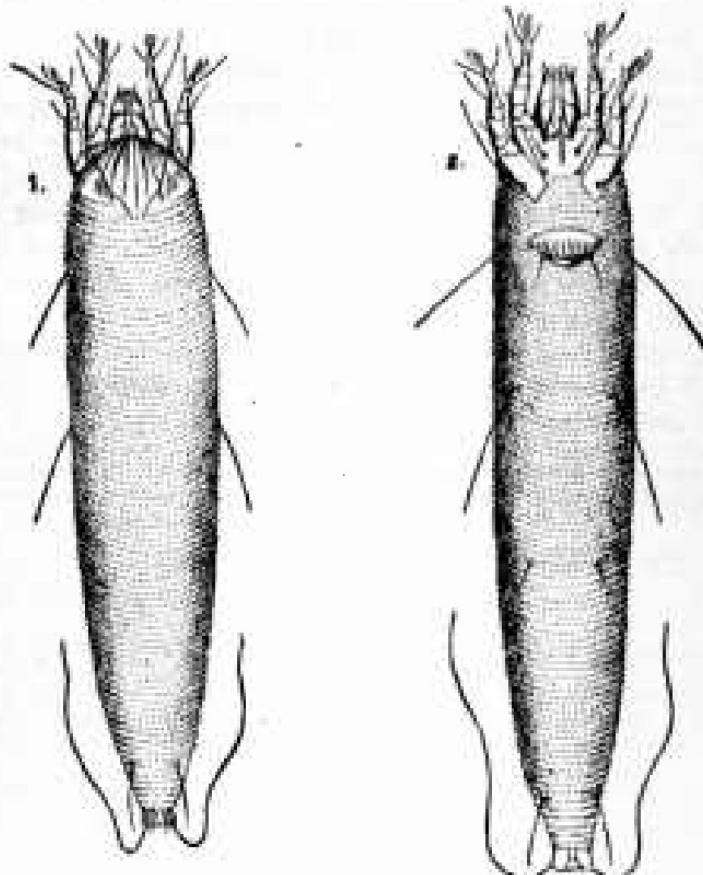


FIG. 4.—Leaf blister mite (*Eriophyes pyri*) : 1, Dorsal view ; 2, ventral view. Greatly enlarged. (After Nalepa.)

these sprays, as for the San Jose scale, should also protect orchards from important injury from the mites. When it is necessary to spray for the mites alone, and in cases of severe infestation, as has been noted in apple orchards in New York State, two treatments have been recommended by Parrott, standard kerosene emulsion being used, diluted with 5 parts of water. One application should be given in late fall as soon as most of the leaves have fallen and

another the following spring before the trees put out foliage. If both the fall and spring applications are not practicable, the preference should be given to fall treatment. At this time many of the mites have not yet gone to the bud scales, but occur in the pubescence of the young wood and hence are more easily killed.

Lime-sulphur washes<sup>1</sup> are excellent treatments for these mites and their employment is perhaps preferable as avoiding danger of injury to fruit buds by the oil sprays. If a lime-sulphur wash is employed, it should be applied with great thoroughness and the tree completely coated so that when spraying is finished it will appear as if white-washed.

On the pear the mites may be kept reduced to an important extent simply by searching out in the spring small branches bearing worst infested leaves, pruning these off and burning them, or sprays may be employed exactly as indicated for the apple, if this is considered necessary.

Except in cases of serious infestation special spraying for the blister mite will not be necessary. As to whether or not it is advisable to spray, the orchardists will have to decide after determining as exactly as is possible the amount of injury that is being done by the mites, and care should be taken not to confound with its injury that which has resulted from fungicidal or Paris-green sprays, and from leaf-spot diseases.

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<sup>1</sup> Information concerning the preparation of lime-sulphur washes and kerosene emulsion will be found in Farmers' Bulletin 650, U. S. Department of Agriculture, pp. 16-25.

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